Renovation Roadmaps for Buildings
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Executive Summary

Why the EU needs Building Renovation Roadmaps

Buildings currently account for around 40% of all energy use in the European Union (EU), and a drastic reduction of energy use and CO₂ emissions from buildings is required for the EU to meet its climate goals, limit its dependence on foreign energy sources, reduce household energy bills, create jobs and re-launch one of the economy’s key sectors (the construction sector). To capture this potential and radically reduce energy demand from buildings, a holistic and long-term strategy for building renovation is needed; roadmaps are an effective tool to achieve this.

The European Union has recognised the potential savings that can be made from buildings and recently agreed that by 30 April 2014, Member States shall establish long-term national strategies or ‘roadmaps’ for mobilizing investment in the renovation of the national stock of residential and commercial buildings, both public and private (Energy Efficiency Directive – EED, Art 4). These building renovation roadmaps will be published and submitted to the Commission as part of the National Energy Efficiency Action Plans.

A practical guide to Renovation Roadmaps for buildings for policy makers

This report is intended as a practical tool and information source for roadmap developers. It includes practical guidance on how building renovation roadmaps can be developed effectively and which elements they should include in order for them to deliver their full potential. A pull-out table is provided at Annex 1, setting out examples of existing policies which may be useful in supporting essential elements of an effective buildings renovation roadmap.

Starting with an analysis of roadmap literature, policy and roadmaps in other sectors (technology and sustainability), Part I of the report suggests a framework structure and process for roadmap development and some key principles for successful strategies; this includes a review of the political support and stakeholder engagement needed, roles of public and private sectors, definition of goals and targets, and time lines of successful approaches. Part II of the report provides more information on the contents of successful building roadmaps. It considers specific examples of policies from existing national and regional building renovation programmes and assesses the conditions under which they are likely to be effective and contribute to the deep renovation of the building sector. This includes an assessment of existing roadmaps and national strategies which finds that many plans that are called roadmaps or national strategies fall short on the elements that would make them effective.

The report includes key recommendations for essential elements for building renovation roadmaps and the roadmap development process.

Key elements of a building renovation roadmap

Roadmaps and strategies for building renovations are more effective if they are tailored to the specific circumstances in the country or region they address and if they adhere to the following overarching principles and elements:

1. **A high level of ambition with a long-term perspective and high level political ownership** to provide key actors with enough lead-in time and certainty to plan and prepare for changes and a sufficiently planning horizon for sustainable change to become visible and materialise. For the EU’s building stock a 2050 horizon would be the best option. Both the need for solutions to these problems and the significant expected benefits must be widely recognised and accepted.
2. **Clear and ambitious targets, including intermediate milestones.** Research has demonstrated that, by 2050, the EU building stock can reduce its final energy consumption for heating and cooling by 80%, with a reasonable annual rate of renovation. This goal should be accompanied by clear intermediate targets (e.g. for the years 2020, 2030 and 2040) developed, whenever appropriate, using a back-casting process. Targets should be based on sound analysis of the status quo, and ways to improve this condition and performance and should be supported by robust monitoring and evaluation processes.

3. **Support and collaborative involvement from all levels of Government, market actors and stakeholder parties.** Good roadmaps are supported by all parties involved, including in their ambitions as well as their short-term plans. All parties also have a role in their implementation and are responsible for fulfilling that role. All parties need to be consulted early on in the development process, and sufficient attention given to parties’ concerns. Promote, coordinate and integrate local and regional renovation initiatives, while building on the strength of market actors.

4. **Flexible but focused iterative development.** Roadmap development is iterative, focusing on goals and directions, and accepting that strategies and action plans may need to be adjusted after some years of implementation. Although roadmaps focus on long-term goals, actions need to reflect the possibilities and limitations of the market at any given moment and tailoring of actions is required throughout the implementation of a roadmap.

5. **Take a holistic approach, addressing the whole building stock, the whole sector and all relevant issues.** Encourage the public sector to play a leading role, while applying a holistic or deep approach at individual building level. Roadmaps need to address all relevant aspects of the buildings and construction sectors, including technologies, construction materials, labour shortages, training needs, and accreditation and certification. Financing of buildings and renovations, full engagement of building owners and occupants, and the identification and removal of legal and regulatory barriers need also to be integral parts of the planning process.

6. **Integrate energy performance with broader societal goals and build on the strength of market parties.** This includes focusing on employment impacts and taking into account changes in society, demographics and housing needs. Roadmaps should build on the strength of market parties, enabling the market to deliver what society needs, providing direction and credibility to society’s demands without defining precisely how the market should deliver solutions.

7. Include **flexible, creative thinking** beyond what has been tried before. Good roadmaps encourage innovation, in technologies, markets, and collaboration between parties, so that there is on-going cost and efficiency improvement of building renovations. Good roadmaps do not merely project doing more of the same but actively aim to put in place new and better ways of renovating buildings, using an iterative back-casting based process that focuses on goals and directions, while accepting that strategies and action plans may need to be adjusted.

8. **Inclusion of financial support, consumer education, and organisational support.** Include financial mechanisms for investment in the deep renovation of the building stock in roadmaps, programmes to inform the public and building sector parties about new policies and requirements, and provide support to facilitate the design, commissioning, construction and supervision of renovation works.
Introduction: Why roadmaps?

The European Commission, in its “Roadmap for moving to a competitive low carbon economy in 2050”, established a long-term objective of decreasing the CO₂-emission levels for the building sector by 88%-91% in 2050, compared to 1990 levels¹. In order to achieve this target, the EU needs to tackle the existing building stock and significantly reduce its energy use in the long-term.

The recently adopted Directive on Energy Efficiency provides the initial framework for achieving this by requiring that Member States shall establish, by 30 April 2014, long-term national strategies for mobilizing investment in the renovation of the national stock of residential and commercial buildings, both public and private (Energy Efficiency Directive - EED, Art 4). National strategies shall be published and submitted to the Commission as part of the National Energy Efficiency Action Plans. They will be updated every three years thereafter.

The Directive requires that these national strategies shall encompass:

- An overview of the national building stock based, as appropriate, on statistical sampling;
- An identification of cost effective approaches to renovations relevant to the building type and climatic zone;
- Policies and measures to stimulate cost-effective deep renovations of buildings, including staged deep renovations;
- A forward looking perspective to guide investment decisions of individuals, the construction industry and financial institutions;
- An evidence-based estimate of expected energy savings and wider benefits.

The combination of these two elements (a 2050 target for reducing CO₂ emissions in the building sector, and obligations to set up national long-term strategies for building renovation) recognises the strategic importance of ambitious national building renovation roadmaps in addressing some of today’s most pressing challenges, notably the sustainable use of resources, energy security, climate change and economic recovery through job creation. National strategies are needed to make Europe’s buildings future-proof from an energy and climate perspective, as well as improving social conditions in urban and rural areas, accessibility and affordability of housing, and to enable the construction industry to continue as a healthy, attractive and profitable business, delivering the renovations that Europe’s building owners need.

What can roadmaps achieve?

A roadmap is a high-level policy tool that focuses on stakeholder coordination, effective communications and shared long-term vision. It must be evidence-based and, prior to the development of the roadmap itself, clear objectives and timing must be agreed upon by all parties involved. Changes actually occur as a result of a successful strategic roadmapping process when stakeholders involved agree to move away from the old way of doing business to a new collaborative approach.

Renovation Roadmaps can bring many benefits to the building sector and society:

- Renovation Roadmaps can create consensus about the desired direction and necessary actions in the building sector, aligning market parties, governments and consumers around actions required for the comprehensive or deep renovation of the building sector;
- Renovation Roadmaps set long-term goals, with intermediate targets and action plans covering a range of government and market parties, and providing a framework for all involved to work within;
- Building renovations deliver a positive return on investment, for building owners, who cut their energy bills, and especially for society;

¹ In the remainder of this report, we refer to a target of 80% energy savings compared to the current average energy performance of buildings, which is broadly comparable to this absolute CO₂ emissions target.
• Building renovations generate jobs, tax revenue and better housing for all parts of society.

Research suggests, for example, that, in Germany, 14 to 16 jobs are created for every €1 million invested in building renovations per year. In addition, investments in building renovations lead to substantial benefits for State budgets, through increased VAT income, additional income and corporation tax, savings on health costs, savings on energy bill in public owned and used buildings, and reduced payments for unemployment benefits, as well as reduced outlay on subsidies for renewables energy. This will be partly offset by reduced VAT income on energy in future years but the net effect is likely to be highly positive for State budgets.

The Need for Ambitious Renovation Roadmaps

Buildings currently account for around 40% of all energy use in the EU and a drastic reduction of energy use and CO₂ emissions is required for Europe to meet its climate goals, limit its dependence on foreign energy sources and reduce household energy bills. The objective set by the European Commission of decreasing the CO₂-emission levels for the building sector by 88%-91% in 2050, compared to 1990 levels, requires reducing energy use in existing building stock significantly in the long-term.

Given that the demand for housing and commercial building space is continuing to grow, albeit slowly, this translates into the need to substantially reduce the energy required for space heating in existing buildings, as well as increasing the use of renewable energy systems in buildings. A recent study indicates that, per building, the space heating energy demand needs to be reduced by around 80%, depending on the amount of renewable energy systems deployed, with more investments in reducing heating demand having a better cost-effectiveness (as it reduces the need for costly renewable energy systems). Similar reductions in energy demand may also be needed to keep household energy bills manageable in coming years, with energy prices expected to continue rising.

Reducing building energy demand for heating by 80% requires a holistic approach to building renovation, combining all necessary measures, for example retrofitting insulation in various parts of the building and heating systems using renewable energy. Single measures (e.g. just replacing windows) are insufficient. In fact, it may be counterproductive to support those single measures if these don’t match with longer-term, comprehensive renovation strategies: These single measures can lock-in energy use at a level lower than currently, but not low enough to capture the full economic savings potential. Changing later to more advanced improvements, often proves to be prohibitively costly.

It is therefore essential that roadmaps and strategies set out a pathway for the renovation of the building stock that includes building renovations, which are sufficiently comprehensive or deep, particularly for building shell measures that have a long life span and for renewable energy parts that are embedded in the building structure. Roadmaps could include measures that are phased in over time, for example with building shell and roofing improvements installed now at a future-proof level, and connections for renewable energy systems such as photovoltaic (PV) panels put in place, with the actual panels installed in later years.

About this report

In this report, we discuss how these national strategies can be developed. We use the phrase Renovation Roadmaps for these strategies, to emphasise that strategies need to target comprehensive renovation of the building stock and need to include long-term goals and directions as well as short-term actions. This report describes how roadmaps can be developed and what elements they should include. We provide examples of roadmaps, assess key elements of successful roadmaps, provide a suggested structure for building Renovation...
Roadmaps and suggest elements of successful policies and programmes that could be included in national strategies.

The report aims to provide stakeholders involved in developing long-term strategies for building refurbishment with some key elements:

- First, we analyse what a roadmap is and identify the main elements of the process for its elaboration. For this purpose, we have gathered lessons from existing roadmaps and programmes in different areas (including technology and sustainable development) and analysed their various stages (including initiation, development, and evaluation). Some key elements can already be drawn from this analysis.

- Secondly, we focus our attention on existing roadmaps and plans for building refurbishment at national, regional and local level (mainly in Europe, but also in other parts of the world). Our point of departure is that there is no such thing as “a perfect roadmap”, as Member States have different starting points and different local conditions. However many constructive lessons can be drawn from the few programmes and strategies that are already out there and from which we were able to derive key elements of policies and programmes that deliver results and the conditions under which they are effective.

- Based on this research, we provide some key recommendations for the forthcoming long-term strategies for building renovation, as well as specific examples of policies that can be used in certain contexts to overcome a number of common hurdles in the sector.
Part I – The Roadmapping Process

The development and successful implementation of a long-term roadmap requires a dedicated effort by governments and market parties to gather information, determine goals and priorities and agree actions.

In this first part of the report, we will:

- Analyse existing examples of policy areas (e.g. technology and sustainability) in which roadmaps have been well established for many years. More detail is provided in Annex 2.
- Focus on the process for the elaboration of these roadmaps, taking as a basis examples of existing roadmaps, and drawing lessons from the common elements of their initiation, development and evaluation.
- Finally, based on these analyses, we will extrapolate key principles essential for the development of effective building Renovation Roadmaps. These will be used in Part II of this report, which proposes a sequence of stages for elaborating robust building Renovation Roadmaps.

1. What is a roadmap and what is not: Lessons learned from more established roadmapping sectors

Roadmaps exist for all kinds of policies, technologies and processes. Roadmaps and strategies are popular terms used to describe initiatives, suggesting direction and clarity. Roadmaps are sometimes defined as “a detailed plan to guide progress toward a goal”, or “a set of guidelines, instructions, plans, or explanations”; strategies as “a plan of action designed to achieve a specific goal” or “a plan, method, or series of manoeuvres or stratagems for obtaining a specific goal or result”. These definitions point to roadmaps and strategies as being detailed plans to achieve defined objectives. Roadmaps and strategies are also supposed to guide implementation of changes, requiring support of all the parties involved.

Several roadmaps have been developed over the last year, addressing the need for deep renovation of the building stock at various levels of comprehensiveness, which provide examples of what a good Renovation Roadmap could look like. Our analysis shows, unfortunately, that many plans called roadmaps or strategies fall short of these definitions and actually:

- Describe an ambition but no implementation, or
- Are not supported by the parties involved, or
- Lack a thorough analysis of the situation, or
- Are narrowly focused implementation plans.

One important lesson is, therefore, that just because a plan is labelled roadmap or strategy, it does not always contain what is required for the adequate renovation of building stock. Roadmaps need to be comprehensive, targeted, well-founded and inclusive to address the issues of building renovation, and many “strategies” and “roadmaps” fall short of this. In this report, we present the key elements a strategy or roadmap should include to qualify as a long-term national strategy for comprehensive building renovation, as agreed in the EED and required for the deep renovation of the building stock.

Every roadmap is different. There are, however, general lessons that can be learnt from roadmap development in various sectors that are useful to determine the principles under which they must be drawn-up, the steps or stages needed to develop a successful roadmap and the actions required for executing it properly.

Some of those lessons originate from technology roadmapping, a well-established process of sketching out routes towards innovative technology within one industrial firm or for a dedicated group of industrial
products. Other lessons are based on experience with sustainable development programmes and strategies, which have been used to help governments and market parties set directions for more sustainable processes across many sectors and including all parts of society. Technology roadmapping, as an established but more narrowly focused process, provides us with the minimum requirements for a building Renovation Roadmap process. Sustainable development initiatives provide guidance for the direction of a roadmapping process that reflects the complexities of building renovation. Lessons learned from technology and sustainable development roadmapping are set out in Annex 2.

2. The roadmapping process in stages

Good roadmaps are evidence-based and have clear and ambitious long-term goals and targets, while needing continuous revision and/or renewal to take into account changes in technology, the market and society, as well as to take into consideration the results achieved so far. This is why the process design is essential for roadmapping. In addition to the “sectorial” examples mentioned above, we can draw lessons from “roadmapping process” having been developed recently at national and European level.

Example of roadmapping approach in national context

The roadmap process shown below is used by the UK Department for Environment, Food and Rural Affairs working together with industry on ten pilot roadmaps. These roadmaps aim to improve sustainability across the life cycles of a range of products including clothing, milk and plasterboard.

Example of roadmapping approach in an EU context

The process described below reflects the high-level steps undertaken by recently published EU roadmaps in a more ‘political’ context i.e. Roadmap for moving to a competitive low carbon economy in 2050 and Roadmap to a Resource Efficient Europe.

An analysis of existing roadmaps, national strategies and renovation programmes in Europe, as well as the sectoral examples outlined above, provided the following model of a good roadmapping process.

Stage 1: Initiating the process

Leadership and requirements. The roadmap must respond to a recognised need from government, business and civil society that a policy area must be addressed. Defining the boundaries of the issues at stake is as important as finding an influential, high-level organisation – either governmental or private – to lead and carry
the process forward. One person or a designated group of people within this organisation must then be appointed to develop the framework and be given the resources and priority to do so. For buildings, this could, for example, take the form of a “Renovation Commission” or “Taskforce”. Their remit needs to be well defined from the start, along with the specific boundaries of what the roadmap should focus on.

**Participants.** All key stakeholders, who will shape up the roadmap framework and ultimately contribute to the action plan, must be involved from the start – with the creation of a database of relevant partners (industry groups, government bodies, academia, consultancies, environmental/consumer organisations etc.). Ideally both a ‘doer’ and a ‘decider’ should be included in all communications with the roadmap participants because the person who attends the most meetings and takes part in the discussions (e.g. sustainability manager, desk officer) might not have the authority to formally agree targets and actions to be undertaken by his/her organisation. NB: When roadmaps are led by public bodies a certain amount of funding is allocated to the tasks at hand (dedicated man hours, meetings, publications etc.) and once private organisations see the benefit of joining in then they do not hesitate to spare time for their staff to get involved in the process.

**Initial workshop.** In order to ensure leadership and collaborative design from the start a workshop can be used to launch the process. A workshop will encourage stakeholders to participate in the roadmap development process and its implementation, and to think creatively about how to make the roadmap a success.

**Evidence review.** In order to establish a shared long-term vision all parties involved in the roadmap must agree on the facts to underpin the solutions they propose. To that end, evidence-based research and data gathering are essential first steps. Putting together the findings of previous studies in a comprehensive document and commissioning additional work to address any gaps in evidence will lay strong foundations for the roadmap.

**Steering Group.** Evidence must be validated by reputed experts to ensure stakeholders buy-in and avoid diverging viewpoints from being introduced by internal participants at later points in the roadmapping process. A consensus vision is better developed under the leadership of a Steering Group or Task Force. Chairs and co-chairs should be appointed for any chosen sub-Working Groups, and attendees should be selected carefully to ensure a wide spectrum of knowledge and proactive behaviours. (However certain political/official processes might involve established rules of engagement such as for building regulation development for which stakeholder outreach and participation is often dictated by law.) The Steering Group should be governed by Terms of References, meet at regular intervals, and be responsible for approving all published roadmap documents and communications.

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### Stage 2: Roadmap development

**Collaborative working.** Following the review of existing policies and the identification of gaps and/or inefficiencies, cross-cutting themes will start to emerge and working groups can be set up to propose solutions to the set of issues identified. It is important to build from the knowledge of participants who might have experience in relevant pilot projects or alternative ways of doing business. Keeping in mind the long-term vision is essential to ensure that the goals set out in the initial development stage of the roadmap are achieved.

**Ambition and rules of engagement.** It is important to establish early on whether the roadmap intends to leave involved participants the choice of setting their own targets/actions or whether a common set of targets should be agreed upon by all. The latter means that the level of ambition might be watered down because
stakeholders might not be able to reach the same results at the same time. Any action must be accompanied with a short, medium and/or long-term deadline and include an effective way of monitoring and reporting progress. Participants are expected to share a certain amount of information amongst them and with the Steering Group. Any hurdles around disclosure of information must be highlighted early on.

**Future scenario proofing.** Any action/policy option should be accompanied by some form of economic and future scenario modelling demonstrating the expected results and how it will meet the ambition set out by the roadmap. By putting together a set of actions/targets within the roadmap, framework participants will then create an Action Plan detailing what should be happening over the coming years, including detailed information about implementation.

**Action Plan.** The roadmap’s Action Plan should be officially launched with (at least) an official press release from the leading organisation and should ideally be presented at a relevant conference and/or a dedicated event. Having an official date for the launch is useful in allowing for annual conferences to be organised and progress reports to be published on the anniversary date.

### Stage 3: Progress and evaluation

**Annual reporting.** As highlighted previously a roadmap is a process and must be subject to periodical reviews and updates because the participants’ needs and technologies will be evolving. The Steering Group – alongside the staff of the leading organisation responsible for day-to-day activities – should lead such a process by frequently communicating with all participants and gathering data on their progress against set targets. Benchmarking tools can also be developed to collect data more easily and better inform the review stages of the roadmap.

**Independent evaluation.** A couple of years after the launch of the Action Plan an independent evaluation into the roadmap’s achievements can be commissioned to highlight the success factors and remaining barriers to be overcome.

### Summary overview of roadmapping stages

The following table provides a summary of the stages detailed above with a particular focus on the activities to be carried out as roadmap components.

<table>
<thead>
<tr>
<th>Roadmap stage</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initiating the process</strong></td>
<td></td>
</tr>
<tr>
<td>Needs: defining the roadmap boundaries</td>
<td>Communication on the roadmap aims, vision and timing. Issues and interdependencies are identified</td>
</tr>
<tr>
<td>Leadership: finding a strong leading organisation</td>
<td>The organisation most likely to carry the process forward successfully is identified. Dedicated resources are allocated to the roadmap</td>
</tr>
<tr>
<td>Participants: stakeholder engagement from the start</td>
<td>Creation of a database of relevant stakeholders Communications on roadmap framework (needs), expected stakeholder involvement and intended timeline for action</td>
</tr>
<tr>
<td>Initial workshop</td>
<td>To kick-start the roadmap process in a collaborative and inclusive manner</td>
</tr>
<tr>
<td>Evidence review</td>
<td>Evidence gathering (impacts, current policies, possible gaps) Additional study commissioned and findings disseminated to participants</td>
</tr>
<tr>
<td>Steering Group: setting up a dedicated task force</td>
<td>Terms of Reference approved Attendees invited to join &amp; appointment of chair</td>
</tr>
<tr>
<td><strong>Roadmap development</strong></td>
<td></td>
</tr>
<tr>
<td>Collaborative working</td>
<td>Participants work on identified themes and policy gaps in relevant working groups.</td>
</tr>
</tbody>
</table>
The Policy Partners

| Sharing of lessons learnt and critical thinking to develop set of policy options/actions. Throughout involvement of Steering Group and organisation/individuals leading the roadmap |
| Ambition and rules of engagement | Deciding on the level of ambition of the roadmap: joint set of targets vs. individual actions Information sharing agreements drafted as needed (e.g. MoU, NDA) |
| Future scenario proofing | Modelling of actions/policy options chosen to achieve targets Economic analysis and future scenarios (EU, national, sectorial level) |
| Action Plan | Agreed set of targets and/or list of actions to be undertaken by the participants gathered in one document Launch of the Action Plan |

### Progress and evaluation

| Annual reporting | Data gathering from all participants Annual Progress Report prepared by leading organisation and approved by Steering Group |
| Independent evaluation | Evaluation of progress vs. targets, savings achieved and adaptations needed to action plans Recommendations to improve the approach as needed |

### 3. Findings: Key elements of the roadmapping process

This analysis finds that the political process involved in developing and implementing a roadmap is essential in ensuring its success. Several process elements that are key to that success.

Roadmaps need **high-level political ownership**, with the political and societal mandate to develop solutions for problems that are widely recognised as relevant issues for the country or region. In order to get all parties on board, it may be necessary to expend time and effort explaining the need for a roadmap to all parties, and emphasising its significant expected benefits across different sectors (e.g. energy, employment, economy). **Substantial involvement of all relevant stakeholders**, during all stages of the development process, from initiation to strategy development and action plans to implementation, evaluation and re-adjustment is key. Stakeholders include parties from across the value chain and also other parts of government, including local and regional governments that have initiated roadmaps. Coordination of the latter and access to central government is important.

Effective roadmap development is an iterative process, **focusing on goals and directions** and accepting that strategies and action plans may need to be adjusted after some years of implementation. Although roadmaps focus on long-term goals, actions need to reflect the possibilities and limitations of the market at a given moment and tailoring of actions is needed throughout the implementation of a roadmap. Effective roadmaps **build on the strength of market parties**, enabling the market to deliver what society needs, providing direction and credibility to society’s demands without defining precisely how the market should deliver solutions.

The perspective taken to set interim targets has a significant impact on the viability and ambition-level of roadmaps. Effective roadmaps have an **ambitious long-term perspective** and actively aim to change current common practice, often through the use of a back-casting process, by defining and creating the conditions for better solutions. The development of roadmaps is typically best served with a combination of forecasting and backcasting. **Forecasting** aims to project current trends into the future and is an important tool in understanding what the current issues are and what may happen if current patterns continue. **Backcasting**, on the other hand, starts with defining a desirable future and then works backwards to identify policies and programs that will connect the future to the present. Backcasting and forecasting are described in the text box below.
**Forecasting versus Backcasting**

The development of roadmaps is typically best served with a combination of forecasting and backcasting. **Forecasting** aims to project current trends into the future and is an important tool in understanding what current issues are and what may happen if current patterns continue. It is an important tool in the analysis of the status quo and of current trends, and a good starting point for the analysis needed for a roadmap. **Backcasting**, on the other hand, starts with defining a desirable future and then works backwards to identify policies and programs that will connect the future to the present. The fundamental question of backcasting is: "if we want to attain a certain goal, what actions must be taken to get there?"

The difference in approach is exemplified in:

![Diagram of Forecasting and Backcasting](image.png)

Weighing up the benefits of backcasting and forecasting in this context:

- Forecasting is based on projecting out dominant trends. It is therefore unlikely for this method to generate solutions that presuppose the breaking of trends.
- The application of forecasting in complex systems such as cities and urban development is questionable. Backcasting provides an interesting alternative approach for the exploration of alternative futures for the built environment.
- Backcasting encourages searching for new development paths when the conventional paths do not seem able to solve the problem.

Backcasting is therefore typically a more suitable approach for developing Renovation Roadmaps, since it:

- Addresses more significant sustainable changes,
- Encourages developing new solutions,
- Encourages new interactions between parties,
- Creates more buy-in from stakeholders,
- Establishes a process of combining long and short-term goals.

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8 Based on: Futures studies' backcasting method used for strategic sustainable city planning, Aumnad Phdungsilp, Futures, Sept 1, 2011
Part II – Key Elements of Building Renovation Roadmaps

This second part of the report is based on our research into specific examples of policies, strategies and programmes in the buildings renovation sector and focuses on how to best develop long-term strategies or roadmaps for building refurbishment.

The previous section provided a basic structure for developing a roadmap in any sector. This section focuses on renovation roadmaps: roadmaps for renovating building stock. It sets out key contents requirements of renovation roadmaps, which can be used as a checklist when initiating a roadmap. It also provides examples of specific policies and actions, which have been used in various contexts to overcome common hurdles. These are further elaborated and provided in a handy pull-out at Annex 1. They can be used as inspiration for filling in the blanks in a roadmap, if required, or as a suggestion to make existing instruments more effective. Overall, this part of the report identifies the questions policy makers and stakeholders should ask themselves when developing a renovation roadmap and supports them in finding the right policies for their specific country context.

Well-designed roadmaps combine ambitious long-term targets with interim goals, qualitatively and quantitatively, and short-term actions. They are the result of engagement of all relevant parties and address all issues that are important for their achievements, such as overarching policy, legislation, standardisation and certification, the role of government and market parties, training and education needs, and changes in the market structure that are needed to implement the long-term approach. Successful roadmaps set a long-term direction for action and regularly update their short-term action plan to account for changes in the market and other factors, ensuring that strategies remain valid for all parties involved. Good roadmaps focus on what is required to enable and encourage the market to deliver society’s goals, and how to implement those changes – and deliver those changes.

This section identifies critical elements of a renovation roadmap. A roadmap always needs to reflect the actual situation in a country or region, with its specific starting point and goals, a specific building stock and sector, and various capabilities and stakeholders. Roadmaps are therefore best developed by the main parties in a country or region themselves. There are, however, key elements that should be represented in a good roadmap, to make sure that it addresses all relevant topics and adequately reflects the issues that need to be taken into account for a transition towards deep renovations of the building stock as common practice. In this section:

First, we outline the key lessons learnt from a selection of existing building renovation policies and programmes (in the EU and elsewhere) that we have analysed in detail. Then, based on these examples, we establish an indicative timeline for building renovation roadmaps. Thirdly, we extrapolate the main principles that, according to our research, building renovation roadmaps should have.

1. Existing examples of building renovation programmes

We have analysed some existing policies, programmes and prospective studies from which several lessons could be drawn about the elements that should be present in effective building renovation roadmaps.

We considered policies which stood out from a number of EU member states, as well as the US and Canada. In addition we looked in more detail at three renovation roadmaps: Basque strategy for sustainable buildings9, the Irish residential energy roadmap10 and the roadmap for Spain’s housing sector11.

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10 “Residential energy roadmap 2050”, Sustainable Energy Authority of Ireland (SEAI)

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Our analysis includes various roadmaps or strategies that possess many of the characteristics needed for a successful roadmap, however, not a complete roadmap or strategy for building renovation. For example:

- Several roadmaps are NGO-driven plans, sometimes prepared with the involvement of the private sector, that, although containing several interesting new ideas or approaches, which could be taken further, often miss broader support and deep analysis of issues in the sector. The valuable start made with these roadmaps could be taken forward by further developing the roadmaps with more Government involvement, inclusion of more sectors of the economy and better alignment with the political decision-making process.

- Several government roadmaps and strategies set out long-term ambitions but fail to specify the policies or initiatives required to achieve those goals. These provide a good starting point for further analysis and development, to detail issues in the building and construction sector, develop common views about a desirable direction for transforming the building stock and sector, and detailed action plans to take practical steps towards the deep renovation of the building stock.

Our analysis of existing policies and programmes has highlighted several elements that are present in effective buildings renovation strategies, policies and programmes. In addition, a number of these programmes have found intelligent solutions to common hurdles (for example practical solutions for repayment of funds used for the renovation works; and ways to make the renovation works and financing more accessible to individuals). Annex 1 provides information on the individual country programmes, which policies they include and under which conditions such policies may be effective in other contexts. The Annex provides this information for each of the 10 elements required for an effective programme. These elements are:

1. **Firm and ambitious overarching targets**: Programmes must have clear, binding and ambitious targets that provide direction to all parties involved and give a clear focus for investment and market development.

2. **Firm and ambitious individual requirements**: Programmes should provide clarity about what needs to be achieved in individual situations, so that building owners and all other parties know what is expected and what they need to do to meet the requirements of a programme – now and in the coming years.

3. **Specification of types of work covered**: Building owners should receive clear guidance about the measures that are supported through programmes and what constitutes, within a programme, a sufficient level of renovation of a building. This helps building owners set out a clear investment trajectory for their property.

4. **Include relevant parties in programme design**: Good programmes include the views of all relevant parties in the building sector in their programme design and outreach. This does not necessarily mean that every individual party gets its way, but every party gets its say – and the programme takes into account that parties have legitimate business interests that need to be met, in order for a programme to succeed.

5. **Based on a solid analysis of the current situation**: No programme can work, long-term, unless it is based on a sound, comprehensive analysis of the current situation and on-going trends in the market. This analysis should cover not only the characteristics of the building stock but also building ownership, occupancy, and relevant aspects of the building sector.

6. **Collaborate with market parties to deliver renovations**: Programmes should focus on making the market function better at delivering building renovations. After all, Governments do not renovate buildings, market parties do – and programmes can only be really successful if they manage to change market conditions so that desired renovations become standard practice over time.

7. **Provide accreditation or certification of market parties**: Many building owners are uncertain about what to expect from building renovation, and lack the skills and experience to check if a contractor has the capacity to perform all renovation tasks up to standard. Programmes can mitigate this uncertainty.

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11 2050 Roadmap for Spain’s Housing sector, elaborated by the “Rehabilitation Working Group” (association of industry, Academia and NGOs)
by providing accreditation or certification, essentially guaranteeing that a market party has proven to have the skills required for the job.

8. **Create legal instruments to back up policy goals**: Supporting and stimulating renovations is a great way to start a deep renovation programme but a market needs more to become sustainable and make deep renovations a standard practice. Legal requirements can provide the certainty that market parties need, allowing the market to do its work and deliver effective and efficient renovation solutions.

9. **Workable solutions for repayment**: The cost of deep renovations can exceed the investment capacity of individual building owners, or they may expect that the payback in the first years will not cover the cost of a renovation. Programmes can help overcome this barrier, for example by providing up-front loans and tying the debt to the property, so that the party repaying the investment is also the one reaping the benefits from the investment, even after a building is sold.

10. **Provide financial support, consumer education and organisational support in combination**: No single instrument can efficiently change the market, however, instruments can be combined in a smart way to create an effective combination of sticks and carrots that address all parties in parallel, generating momentum for a sustainable transformation of the renovation market.

We hope that the Annex will prove to be an invaluable tool to policy makers in drawing up long-term building renovation roadmaps.

**2. Indicative timeline for building renovation roadmaps**

If building roadmaps are to contribute effectively to the EU reaching its Climate and Energy objectives, then they should aim for a situation in, or before 2050, where the energy consumption of the building stock has been reduced by at least a factor 4 or 5, and where the country’s existing building stock has undergone a renovation that reduces its energy demand to a high performance or “near zero energy” level.

In this section, we set an indicative time line of targets for a roadmap or national strategy, not as a recipe for a national roadmap but as an example of how targets can be constructed. Targets should cover all relevant aspects of building renovation strategies and reflect how actions, in one year, can build on those in previous years. They should also reflect the non-linear character of transitions, which aim to first make deep renovations a common, well-established, efficient practice before large-scale implementation takes place.

The table on the next two pages sets out an indicative overview of targets per year, working backwards (backcasting) from final goals. Please note that this overview is not a complete and comprehensive set of targets for a specific economy; any country or region will need to develop its own set of targets reflecting their specific circumstances.

**Overview of examples of possible targets, performance indicators and milestones for renovation roadmaps**

<table>
<thead>
<tr>
<th>Target year</th>
<th>Target</th>
</tr>
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</table>
| 2050        | • Energy demand of the building stock reduced by 80%.  
              • All buildings meet “near zero energy“ or high energy performance level. |
| 2040        | • 65% of all buildings pre-2015 renovated to deep renovation standard: “near zero energy“ or high energy performance level.  
              • Around 3.5% of the building stock undergoing deep renovations, per year  
              • High energy performance level, defined in law as energy classes or absolute energy consumption targets, required as condition for sale of rental of all commercial and residential properties  
              • 95% of consumers aware of benefits of deep renovation and provided with individual advice about options and benefits for their building  
              • Deep renovation techniques for historical and culturally relevant buildings cost-optimised and offered as turn-key solution  
              • Historical and culturally relevant buildings are renovated, 4% of this segment of the... |
<table>
<thead>
<tr>
<th>Year</th>
<th>Key Goals</th>
</tr>
</thead>
</table>
| 2020 | - 5% of all buildings pre-2015 renovated to deep renovation standard: “near zero energy” or high energy performance level.  
- Around 1% of the building stock undergoing deep or NZEB renovation, per year, as part of which  
- Around 2% of public buildings undergoing deep or NZEB renovations, per year  
- Deep renovation techniques fully developed for most common building types  
- Deep renovation techniques demonstrated and optimised for all building types  
- 20% of construction companies certified for deep renovations and 20% of workers in construction industry trained in deep renovation techniques |
| 2025 | - 15% of all buildings pre-2015 renovated to deep renovation standard: “near zero energy” or high energy performance level.  
- Around 3% of the building stock undergoing deep renovations, per year, as part of which:  
  - Around 4% of public buildings undergoing deep renovations, per year  
  - Around 4% of social housing stock undergoing deep renovations, per year  
- Legislation prepared that requires public and social buildings to meet a high energy performance level, defined in law as energy classes or absolute energy consumption targets, as a condition for use or rental of properties  
- Deep renovation techniques fully developed for all building types  
- 50% of construction companies certified for deep renovations or NZEB and 50% of workers in construction industry trained in deep renovation or NZEB techniques  
- Deep renovation techniques part of all school and university curricula  
- Banks routinely offer deep renovation mortgages, conditions similar to regular mortgages  
- Government support banks offering soft loans for deep renovations, for socially relevant groups  
- Consumer education centres established to inform building owners about deep renovations  
- 20% of consumers aware of benefits of deep renovation and provided with individual advice about options and benefits for their building  
- Deep renovation techniques for historical and culturally relevant buildings being developed and optimised |
| 2030 | - 30% of all buildings pre-2015 renovated to deep renovation standard: “near zero energy” or high energy performance level.  
- Increase in deep renovations to around 3.5% of the building stock per year  
- Legislation prepared that requires all properties to meet a high energy performance level, defined in law as energy classes or absolute energy consumption targets, as a condition for sale or rental of properties  
- High energy performance level, defined in law as energy classes or absolute energy consumption targets, required as a condition for rental of social housing and for use of public buildings  
- Deep renovation techniques fully developed, cost-optimised and offered as turn-key solution  
- An abundance of construction companies to be certified for deep renovations and all workers in construction industry trained in deep renovation techniques  
- 50% of consumers aware of benefits of deep renovation and provided with individual advice about options and benefits for their buildings  
- Deep renovation techniques for historical and culturally relevant buildings fully developed |

12Definitions of energy classifications would need to be improved to better reflect real energy use, especially for low energy or near zero energy buildings. In addition, compliance systems need to improve so that authorities have the capacity to check compliance with large numbers of renovations to high energy performance levels.
<table>
<thead>
<tr>
<th>Year</th>
<th>Details</th>
</tr>
</thead>
</table>
| 2017 | - Deep renovation techniques demonstrated and optimised for most common building types, in particular in public buildings and social housing  
- Deep renovation techniques developed for all building types  
- 5% of construction companies certified for deep renovations and 5% of workers in construction industry trained in deep renovation techniques  
- Universities and schools have developed education materials and plan inclusion in curricula  
- Governments have a financing schemes in place for renovating public buildings  
- Governments have a financing schemes in place for deep renovations demonstrations of social housing  
- Banks and Treasuries assess impact of deep renovations on affordability of common mortgages and explore deep renovation mortgages  
- Consumer education materials prepared for use in initial consumer education and outreach  
- Government funding available for research, development and demonstration of deep renovation techniques  
- Government funding available for training of construction workers |
| 2015 | - Full inventory of building stock completed, discussed and agreed with stakeholders, including detailed assessment of the long-term savings potential in the building stock  
- Agreement on the performance level that all renovated buildings will need to reach by 2050 and the strategy to reach that level  
- Full inventory of construction sector and supply / value chain prepared, discussed and agreed with stakeholders  
- Full overview of deep renovation techniques and options, including applicability for specific building types and costs prepared, discussed and agreed with stakeholders  
- Deep renovation techniques developed for most common building types  
- Training and educational materials prepared for use in initial professional training  
- Governments support deep renovation research, inventories and stakeholder interaction |
| 2014 | - Stakeholder forums established with first year work plan, chairperson, budget, roles and responsibilities of members  
- Launch event held for national or regional building renovation roadmap, with high-level political, industry and societal involvement  
- “Renovation Commission” or “Task Force” created  
- White papers or similar notes about renovation issues circulated |
3. Findings: Fundamentals of building renovation roadmaps

Building Renovation roadmaps need to focus on renovation of the overall building stock more than on renovation requirements for every single building. Sector-wide performance requirements will have an impact on individual buildings, however, not all buildings will need the same level of retrofit to meet targets and contribute to the overall reduction of energy demand and CO₂ emissions needed in the building sector. It is therefore essential that a roadmap sets out how the building and construction sector can deliver the speed and level of building renovations necessary for all building categories/types, cost-effectively and efficiently, with innovative solutions and in sufficiently large volumes. In the light of the previous chapter we can now work out the main requirements for building renovation roadmaps.

The fundamentals of robust building renovation roadmaps are:

**Cover a longer period of time, long enough for sustainable change to take root and materialise:** Building renovation roadmaps cover a long period, up to 2050, to provide a stable investment perspective and sufficient time to plan and implement changes in the structure of the market and to develop innovations in building renovations, to drive down cost and improve efficiency. The roadmap should assess what impact the strategy will have on its end goal for 2050 and if the rate of renovation is sufficient to reach that target.

**High ambition level needed, well-supported within government and society, with clear targets:** Building renovation roadmaps should aim for energy and emissions targets that meet society’s long-term goal of 88% to 91% emission reduction in the building sector by 2050\(^{13}\), needed to meet Europe’s climate and energy goals taking into account contributions from other sectors of the economy.

Recent research\(^ {14} \) demonstrates that the most eco- and cost-efficient pathway for attaining the 2050 target for buildings is to aim for the deep renovation of the EU building stock. This can be achieved through ambitious building refurbishment roadmaps.

These goals need to be discussed within government and with stakeholders, and it is important that all relevant Government departments and stakeholders support the overarching goal of the roadmap. Firm final and interim targets should be set for key aspects of the roadmap, such as the energy performance of renovated buildings, and the number of buildings to be renovated per year. They should include at least:

- Long-term overall targets for the building sector for at least 2030 and 2050 (in CO₂ primary and final energy demand);
- Long-term, sector-specific targets (number of buildings renovated by 2030 and 2050, max kWh/m\(^2\) targets, renewable energy targets);
- Interim goals and targets for each 5 to 10 year step in the roadmap to 2050, with more detailed goals for the first decade, e.g.:
- Number of renovations per year by 2020 and 2030;
- Interim targets for maximum energy demand (kWh/m\(^2\)) in renovated buildings;
- National standards introduced mandating minimum energy performance levels for renovations;
- Financial support mechanisms introduced.
- Number of companies certified for, and number of workers trained in, deep renovations;
- Number and comprehensiveness of training programmes developed;
- Number and comprehensiveness of consumer education programmes introduced;
- Improved compliance systems for building and renovation requirements;

\(^{13}\) As specific in the EU Roadmap “Moving to a competitive and low carbon economy”

\(^{14}\) “Renovation Tracks for Europe up to 2050 - Building renovation in Europe - what are the choices?” Ecofys, October 2012
Interim targets should be defined for relevant evaluation moments, e.g. every 3 to 5 years up to 2030. Targets are preferably developed based on a backcasting approach and the steps needed in all relevant aspects of the building and construction sector to achieve this goal, in three to five year increments.

**Based on sound analysis of status quo, options, existing barriers:** A building renovation roadmap is built on a detailed assessment of the current situation, so that all relevant aspects are known, sub-sectors with similar or different issues can be identified and addressed, and the strategy can reflect the real world issues that parties in the sector encounter on a day-to-day basis. This requires a detailed analysis of the status quo in the buildings stock as well as in the value or supply chain of the construction sector. The starting point for a roadmap is a detailed analysis of the building sector, and all aspects that affect buildings and building renovation options. This analysis should include:

- Building characteristics and types in the existing stock;
- Building ownership, broken down by building type and region;
- Technical options for deep retrofits, differentiated by building type, region (if applicable);
- The long-term energy savings potential in the building stock, based on a sound assessment of current energy consumption levels;
- Costs and benefits, in detail, for various situations;
- Co-benefits of energy retrofits;
- Construction sector trends and issues;
- Legal requirements for buildings and building renovations;
- Existing policies and programmes, and how these are implemented;
- Existing financing options, including third-party financing and shared savings, and how these are used;
- Impact on state budget from implementation of various policy pathways;

**Need to address the whole sector and all relevant issues, differentiated by sub-sectors:** All aspects of the building and construction sector need to be addressed in the roadmap, such as building and renovation technologies, construction materials, shortages of workers, training needs, financing of buildings and renovations, building owners and occupants, legal and regulatory barriers and other relevant aspects. Strategies need to be differentiated for sub-sectors with different issues, so that the approach matches the needs for each part of the building sector.

An important initial step for a roadmap is a detailed analysis and understanding of the construction sector’s supply or value-chain, and all aspects that affect buildings and building renovations. This analysis should include:

- Descriptions of all parties involved (whole supply / value chain);
- Sector characteristics, e.g. size of companies, ownership structure, financial strength;
- Industry and professional organisations;
- Financial / mortgage industry / ESCOs / financing issues;
- On-going education and training activities;
- Capacity and training needs;
- Other relevant issues;

**Offering and stimulating financial mechanisms to support deep renovations.** Deep renovations can require larger investments than home owners would make for normal building maintenance and, even though investments are cost-effective over time, outside funding will often be needed to enable the initial investment. Soft loan programmes or other forms of financial support should be made available in conjunction with other measures, so that funding is available when building owners are encouraged or required to invest, and the construction market is ready to deliver deep renovations.

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15 Working backwards from the aim to have a robust deep renovation business in place over the next years (and continuing deep renovations up to 2050),
Many financial instruments have been applied successfully and roadmaps should consider which of these are most applicable to the building sector in the country or region addressed. Types of financial instruments include (between brackets: examples of successful implementations)\textsuperscript{16}:

- Loans and preferential loans (Estonia: The Credit and Export Guarantee Fund; France: Green Loan for Social Housing; Germany: KWF Programme Energy-Efficient Construction);
- Grants (Czech Republic: Green Investment Scheme; Hungary: Grants for Renovation & Prefabricated-Panel Residences; Romania: Programs for the thermal rehabilitation of multi-level residential buildings);
- Subsidies (Poland: Infrastructure and Environmental Operation Programme; Slovenia: Financial stimulation for energy efficiency renovation and sustainable buildings of new buildings; UK: Carbon Emissions Reduction Target);
- Third Party Financing (Austria: Successfully establishing a regional Market for Third Party Finance; Netherlands: Meer met Minder programme; Poland: Thermo-modernisation and Renovation Fund);
- White certificates (France: White Certificate Trading; Italy: White certificates);
- Tax rebates (Belgium: Tax Rebates for Home Improvements; UK: Stamp Duty Relief for Zero Carbon Homes);
- Tax deductions (Netherlands: Energy Investment Allowance; UK: Landlords’ Energy Saving Allowance);
- VAT reductions (Belgium: Reduced VAT on home refurbishment; UK: Reduced Sales Tax for Energy Savings Materials).
- Energy Utility Obligation when used as a tool to support a broader policy (UK: Energy Efficiency Commitment / Carbon Emissions Reduction Target)

**Take into account changes in society, demographics and housing needs:** Building renovation roadmaps must reflect that both society and the building sector change over time, and that the strategy is flexible enough to accommodate such changes. Good roadmaps do not assume that current opportunities will always exist, nor that current barriers will always persist, but actively investigate the trends and developments that are affecting the building and construction sector at the time and how these can be utilised to make the strategy stronger and create a better business case for deep renovation of the building sector.

**Integrate energy performance with health, safety, access, comfort, waste and broader societal goals:** Energy aspects of buildings need to be addressed, alongside other relevant non-energy requirements during renovation, such as health, safety, access, comfort, waste disposal and broader societal goals. Roadmaps should aim to integrate all aspects in one comprehensive approach, ensuring that renovations can be carried out in a cost-effective and efficient way and cover all relevant aspects.

**Include flexible, creative thinking beyond what has been tried before:** Building renovation roadmaps encourage innovation, in technologies, markets, and collaboration between parties, so that there is on-going cost and efficiency improvement of building renovations. Good roadmaps do not just project doing more of the same but actively aim to put in place new and better ways of renovating buildings.

**Include robust monitoring and evaluation processes:** Building renovation roadmaps should build monitoring and evaluation into their strategies and action plans. Doing this enables effective tracking of progress and evaluation of results, against a clear baseline. It also enables the adjustment of activities in response to developments within (or outside of) roadmap activities, to better respond to market needs, while maintaining focus on the roadmap’s goals and targets.

**Collaborate with market parties to deliver renovations:** Strategies that enable market parties to deliver building renovations in a commercially sound way typically have a better long-term success rate than those that rely on Government to provide a short-term push for measures. Good roadmaps are built around

\textsuperscript{16} Source: Making Money Work for Buildings. Financial and Fiscal Instruments for Energy Efficiency in Buildings, EuroACE / Klinckenberg Consultants, September 2010. Some of the examples mentioned are no longer active, however, they still point to successful examples of financial instruments that can have a place in renovation roadmaps also. In additional, related information is available in “BPIE’s report State of Play of Financial Instruments - where Europe stands now” at: http://www.bpie.eu/financial_instruments.html
transitioning business from delivering what is currently most common to what is needed to meet society’s long-term goals – in a commercially sensible way.

Additionally governments should facilitate the process by:

**Stimulating training for engineers, architects and construction workers.** Experts and workers need training to learn how to properly implement deep renovations and to install materials and systems. This training should be timed with the introduction of requirements and/or support programmes for deep renovations, so that learned skills can be applied soon after the training.

**Investing in consumer education and outreach.** Home owners and occupiers need to be made aware of the need for deep renovations and educated regarding the possibilities and requirements related to deep renovations, as well as of the significant financial benefits over time of investments in deep building renovation. These communications should link to other activities, such as financial support for renovations, legal requirements and certification of architects and construction companies.

**Providing logistical support to home owners.** Planning, contracting, managing and checking whole-building renovations, which deep renovations typically are, requires professional or near-professional skills which most building owners do not possess and will not often need. The construction market is not yet organised around providing building owners with turn-key renovation solutions and logistical support is required to make deep renovations more accessible to building owners.

**Putting in place legal structures and requirements for deep renovations.** Once there is sufficient experience with deep renovations and society has seen its benefits, legal requirements are an efficient and effective way to create a market for deep renovations in which companies can improve services and reduce costs.

**Requiring standardisation and certification of renovations and renovation companies.** Building renovations are partly unregulated and, even when regulated, performance levels for renovations are often not consistent with the need to future-proof buildings. Standardisation of requirements would create clarity in the market for all parties, facilitating the market to optimise services and create a pathway for Governments towards making deep renovations standard practice in parts, or all, of the building stock. Certification of construction companies, who can work to agreed standard levels of performance, would create clarity for building owners and make the market function better.

**Providing accreditation or certification of market parties**. Market parties provide efficiency, innovation and the capacity to deliver a large number of renovations. Governments, however, are needed to organise the market and provide customers with the means to ensure the quality of advice and building work. Accreditation and certification of assessors and construction companies are important tools with which to do this, and to allow the market to function properly.

Action plans need to consider the roles of all levels of government (local, regional, national and European), how these roles interact and what actions are needed to coordinate the efforts of the various levels of Government. Similarly, plans should consider the roles of all parties in the supply chain, which actions are needed for each of these, which conditions each party needs to fulfil its role and what kind of coordination between parties is needed. A list of links to other government policy areas (national and European) is provided in Annex 3.

These are all characteristics of effective and efficient programmes and policies. Roadmaps and strategies built around those characteristics have a better chance of success.

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17The revision of the Energy Performance of Buildings Directive addresses this gap, in part. However, even when new requirements are in place and implemented, many renovations are still not subject to building regulations. Many cosmetic renovations such as new floors, ceilings or wall finishing, for example, require substantial investments and can lock-in the potential to later renovate the building from an energy perspective, but are not regulated and there is no guidance about the energy measures that should be taken in parallel to these renovations.
Conclusions

Before 30 April 2014, Member States of the European Union must draft long-term strategies for mobilising investment in the renovation of their building stocks. In the European Union and elsewhere, there are numerous examples of ad hoc programmes and financial schemes in the area of building renovation. This report has analysed some of those programmes, as well as the few initial attempts at renovation roadmaps. Alongside roadmapping theory, this has provided us with insight as to what good renovation roadmaps could look like and examples of useful policies, which could be included in renovation roadmaps to make them effective and assist in overcoming common hurdles (Annex 1). We have come up with some “must haves” and some checklists. However, no two roadmaps are alike and for good reason: each roadmap is context-specific and must be built around the situation in a given country at a given time..

Our research concludes that long-term building renovation roadmaps will be more effective and deploy all their potential if they adhere to the following overarching principles:

1. **A high level of ambition with a long-term perspective and high level political ownership** to provide key actors with enough lead-time and certainty to plan and prepare for changes and a sufficiently long planning horizon for sustainable change to become visible and materialise. For the EU’s building stock a 2050 horizon would be the best option. Both the need for solutions to these problems and the significant expected benefits must be widely recognised and accepted.

2. **Clear and ambitious targets, including intermediate milestones**. Research has demonstrated that, by 2050, the EU building stock can reduce its final energy consumption for heating and cooling by 80%, with a reasonable annual rate of renovation. This goal should be accompanied by clear intermediate targets (e.g. for the years 2020, 2030 and 2040) developed, whenever appropriate, using a back-casting process. Targets should be based on sound analysis of the status quo, and ways to improve this condition and performance and should be supported by robust monitoring and evaluation processes.

3. **Support and collaborative involvement from all levels of Government, market actors and stakeholder parties**. Good roadmaps are supported by all parties involved, including in their ambitions as well as their short-term plans. All parties also have a role in their implementation and are responsible for fulfilling that role. All parties need to be consulted early on in the development process, and sufficient attention given to parties’ concerns. Promote, coordinate and integrate local and regional renovation initiatives, while building on the strength of market actors.

4. **Flexible but focused iterative development**. Roadmap development is iterative, focusing on goals and directions, and accepting that strategies and action plans may need to be adjusted after some years of implementation. Although roadmaps focus on long-term goals, actions need to reflect the possibilities and limitations of the market at any given moment and tailoring of actions is required throughout the implementation of a roadmap.

5. **Take a holistic approach, addressing the whole building stock, the whole sector and all relevant issues**. Encourage the public sector to play a leading role, while applying a holistic or deep approach at individual building level. Roadmaps need to address all relevant aspects of the buildings and construction sectors, including technologies, construction materials, labour shortages, training needs, and accreditation and certification. Financing of buildings and renovations, full engagement of building owners and occupants, and the identification and removal of legal and regulatory barriers need also to be integral parts of the planning process.

6. **Integrate energy performance with broader societal goals and build on the strength of market parties**. This includes focusing on employment impacts and taking into account changes in society, demographics and housing needs. Roadmaps should build on the strength of market parties, enabling the market to deliver what society needs, providing direction and credibility to society’s demands without defining precisely how the market should deliver solutions.
7. Include **flexible, creative thinking** beyond what has been tried before. Good roadmaps encourage innovation, in technologies, markets, and collaboration between parties, so that there is on-going cost and efficiency improvement of building renovations. Good roadmaps do not merely project doing more of the same but actively aim to put in place new and better ways of renovating buildings, using an iterative back-casting based process that focuses on goals and directions, while accepting that strategies and action plans may need to be adjusted.

8. Inclusion of **financial support, consumer education, and organisational support**. Include financial mechanisms for investment in the deep renovation of the building stock in roadmaps, programmes to inform the public and building sector parties about new policies and requirements, and provide support to facilitate the design, commissioning, construction and supervision of renovation works.

Long-term building renovation roadmaps can bring many benefits to society and the building sector:

- Renovation Roadmaps can create consensus about the desired direction and necessary actions in the building sector, aligning market parties, Governments and consumers around actions needed for the deep renovation of the building sector;
- They set long-term goals, with interim targets and action plans covering a range of Government and market parties, providing a framework for all involved to work within;
- Building renovations deliver a positive return on investment, for the building owner by cutting their energy bill, and especially for society;
- Building renovations generate jobs, tax income and provide better housing for all parts of society.

Good roadmaps must address the need for immediate action: if significant results are to be achieved, the work must start now.
Annex 1: Examples of effective policy solutions used to overcome common hurdles

Our analysis of existing policies and programmes has highlighted several elements that are present in effective strategies, policies and programmes. In this section, we provide specific examples of each of these factors, indicating in which circumstances these operate and where they are likely to be effective.

**Firm and ambitious overarching targets**

<table>
<thead>
<tr>
<th>Case</th>
<th>Relevance and effectiveness for renovation roadmaps</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>France:</strong></td>
<td></td>
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<tr>
<td>• “Overarching” target: reduction of 38% of energy use by 2020, linked to a 40% reduction target for the public sector. The 38% objective has been translated into more specific targets for social housing</td>
<td>▪ Prioritising least efficient housing makes sense: in particular in lower income housing where fuel poverty may be an issue and to focus on deep retrofits (including whole building envelope measures) where the greatest benefit to cost savings lie.</td>
</tr>
<tr>
<td>• Social housing aims to renovate 800,000 units by 2020. Prioritising classes F and G (also allowing classes E and a limited amount of D classes).</td>
<td>▪ Increasing targets initially is sensible where a programme is starting out and needs to gain traction over time.</td>
</tr>
<tr>
<td>• Expects 0% green loans to be granted to 240,000 owners in 2011, 320,000 in 2012 and 400,000 in 2013 and thereafter.</td>
<td>▪ In most contexts the overall proportion of renovations (around 1% of total housing stock) would be on the low side. The aim for the 0% green loans which represents just under 3% of private property per year would be at the bottom end of what would be considered ambitious.</td>
</tr>
</tbody>
</table>

| Netherlands: | |
| • The Dutch “More with Less” (“Meer met Minder” (MmM)) programme aims to make 2.4 million existing buildings 20 to 30% more energy efficient by 2020 with an interim target of 500,000 existing buildings in 2011. | ▪ Rate of renovation: The overall MmM aim is renovation in around 4% of housing stock p.a.. This is a more ambitious target than a 3.5% p.a., the latter of which would enable the whole building stock to be refurbished by 2050. |
| • More than 60% of the technical potential in existing buildings needs to be addressed to realise the 28 Gwh (100 PJ) energy savings target by 2020 (76% in the residential sector, and 24% in the industrial, commercial and public sectors.) | ▪ Translating such a rate into an interim figure (e.g. 500 000 buildings in 2011) provides visibility and helps in tracking progress. Also, such interim targets (ideally mirrored in 2020, 2025, 2030 etc.) are necessary measures as part of an overall strategy which can be non-linear and will differ depending on the country-context. |
| • The MmM plan formalises the different targets the energy sector and other organisations commit themselves to execute. | ▪ Establishing a performance target as a percentage improvement for all buildings (e.g. 20-30% by 2020) can be a good start to allow the market to build capacity for renovation and become used to using packages of renovation measures. However, this should be part of a long-term plan, where the works done in each building contribute to the 2050 final goals (e.g. 80%). In fact, the Dutch 20-30% target may generate numerous “lock-in effects” whereby the future saving potential is lost, if people are neither aware of the final goal, nor of their buildings’ real potential. |
| • Performance indicators include the number of dwellings with B-label and the number of dwellings for which the label has improved by at least two label categories. 210,000 buildings should thus be upgraded annually to B-label quality. | In individual contexts a balance needs to be struck |
between the depth of the retrofits and the timeframe in which the target can be reached.

- Increasing the level of energy efficiency retrofits used as an indicator over time (e.g., here, moving from B towards A and the A+s) can be helpful in building the momentum of a programme towards deeper retrofits.
- Tying targets to overarching country-goals will be a necessary part of any sensible plan.

### Firm and ambitious individual requirements

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<tr>
<th>Case</th>
<th>Relevance and effectiveness for renovation roadmaps</th>
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</table>
| **Netherlands MmmM requires:**  
  • Homes to become at least B-label (in future this is planned to increase); or  
  • Improvement by at least 2 categories  
  • Requires at least one easy and one more difficult renovation.  
| These types of requirements would be effective in most situations and could be made more stringent to ensure deeper renovations. It is generally helpful to find ways of incentivising multiple measures and, in particular, deeper measures. |
| **France:**  
  • For residential 0% green loans, renovation project must include at least 2 types of work amongst a list of 6 (roof, wall and windows insulation, replacement of heating system and/or renewable energy for heating or water heating).  
| Conditioning access to the loan to a number of renovation measures is a good way to spread deeper renovation practice. This is a useful requirement and should be considered as a minimum individual ambition level in most contexts. Beware of implementing measures that encourage mainly work which would have been likely to be undertaken anyway. |
| **UK:**  
  • Energy Act 2011 states that from April 2018 all private rented homes or business premises must be brought up to a minimum energy efficiency rating of ‘E’ in order to be rented out – effectively banning the least efficient ‘F’ and ‘G’ properties (amounting to ~18% of UK non-domestic properties).  
| Rental markets can be difficult to tackle where there are split incentives between landlord and tenant (with landlords having to pay for the improvements and tenants benefiting from the savings). Where the rental sector has a significantly higher proportion of less efficient homes, measures focused on the rental sector can be useful. Likewise where the rental sector is characterised by significant proportion of fuel poor these measures can help. Another key aspect in such measures is to put works into a time perspective, whereby all landlords will have to take action before a certain date. This is also fundamental to improving the market value of renovated buildings. |

### Specification of types of work covered

<table>
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<tr>
<th>Case</th>
<th>Relevance and effectiveness for renovation roadmaps</th>
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</table>
| **France:**  
  • For residential 0% green loans renovation project must include at least 2 types of work amongst a list of 6: roof, wall and windows insulation,  
| These measures are likely to be effective if sensibly combined with energy audits and the types of |
replacement of heating system and/or renewable energy for heating or water heating.

UK:
- The measures of energy efficiency improvement that qualify under the UK Green Deal include air source heat pumps; biomass boilers and room heaters; ground source heat pumps; micro combined heat and power; micro wind generation; photovoltaic; solar water heating; solar collectors; and water source heat pumps.

Canada:
- Grants are provided for investing in draft proofing, insulation, efficient heating, cooling, water heating, ventilation equipment, new windows etc.

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### Include relevant parties in programme design

<table>
<thead>
<tr>
<th>Case</th>
<th>Relevance and effectiveness for renovation roadmaps</th>
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<tbody>
<tr>
<td>Netherlands:</td>
<td>Generally, the process can benefit from having all of these types of party involved from an early stage. In most contexts it will be useful to get their input and buy-in as early as possible. The Dutch have a strong history of collaboration. The MmM is a voluntary plan based on collaboration. In most contexts more formal requirements would be required than a signed voluntary plan. However, having the parties involved from inception and signing up to a plan that they all agree on is likely to produce a better plan and improved results in all contexts.</td>
</tr>
<tr>
<td>Basque Country:</td>
<td>The Basque Country roadmap describes itself as a “basic strategy” at this stage. However, it already includes different levels of government, which is important in all contexts, particularly at this early stage. It is also generally important to recognise the need for participation of actors from different sectors of the economy.</td>
</tr>
<tr>
<td>Spain:</td>
<td>It is always useful to involve a wide range of perspectives and to draw on international experience early on. The representatives, in this case, do not include as many of the parties that would be involved in the rolling out of an eventual action plan as would be desirable. It is generally also useful to include those who will be involved in implementation as early on as possible.</td>
</tr>
<tr>
<td>USA:</td>
<td>Including different levels of government is important to ensure buy-in from all parties involved, and reduce</td>
</tr>
</tbody>
</table>

UK:
- The measures of energy efficiency improvement that qualify under the UK Green Deal include air source heat pumps; biomass boilers and room heaters; ground source heat pumps; micro combined heat and power; micro wind generation; photovoltaic; solar water heating; solar collectors; and water source heat pumps.

Canada:
- Grants are provided for investing in draft proofing, insulation, efficient heating, cooling, water heating, ventilation equipment, new windows etc.
between the federal state and sponsors e.g. utilities, state energy offices and not-for-profit organisations responding to a growing local interest.

the risk of non-implementation of agreed measures.

### Based on a solid analysis of the current situation

<table>
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<tbody>
<tr>
<td>Basque Country roadmap includes:</td>
<td>This is a highly detailed analysis, at an early stage in the development of the strategy, which provides a solid overview of the current situation and also its interactions with a number of other relevant sectors and socio-economic issues. These types of analyses of the current situation and future potential would be helpful in almost all situations.</td>
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</table>
| • A detailed description of the Basque residential housing stock including: the amount of houses; age of the house and occupancy type; type of ownership (including at a provincial level and compared to other EU economies); level of vulnerability of households based on social factors evaluated; current energy efficiency performance levels; other social considerations (e.g. accessibility, habitability); the relative importance of the residential sector in the Basque context; the situation concerning new buildings and renovation; the role of the construction industry; related relevant segments of the construction industry (e.g. machinery suppliers, hire, estate agents, architects etc.); and an evaluation of the situation in the Basque country with regard to the building sector and the associated energy / environmental sector.  
  • An evaluation of the performance of the stock  
  • A description of the evolution of action on the stock including new and renovations and the potential for transformation is analysed. |                                                                                                                   |
| Ireland:                    | These types of analyses of the current situation and future potential scenarios would be useful in almost all situations. It is extremely helpful to have them included at such an early stage. |
| • The Irish 2010-2050 roadmap is a first step towards a more comprehensive roadmapping exercise. At this early stage, it already provides a solid picture of the current housing stock by modelling the Irish residential housing stock based on SEAI data built up over many years.  
  • It also creates a number of scenarios: a solid baseline scenario (including the effect of regulations currently in force) as well as an “Improved Building Regulations” scenario including the impact of expected revised building regulations. It then goes on to develop four potential scenarios for saving emissions (Low, Medium, High E and High F).  
  • It also sets out average current energy use and emissions per dwelling with the projected impacts based on the various scenarios. |                                                                                                                   |
| Spain:                      | The type of in-depth evaluation will be useful in all contexts. In addition, the use of “hot-spots” as tools for considering groups of homes with homogenous... |
| • In-depth evaluation an analysis of existing housing stock  
  • Grouped housing stock into grouping into hot- |                                                                                                                   |
spots or quantitatively significant groups of homes with homogeneous characteristics. Homes within each “hot-spot” share contextual characteristics that are important for their refurbishment like age, urban setting, number of floors and decision making body (family or community) and have been further classified into three sub-segments by energy intensity.

- Sensitivity analysis and modelling has then allowed the high-level mapping of financing solutions and rates of progress onto each “hot-spot” to build a picture of the new/changed housing sector.
- Considers a range of social issues, e.g. fuel/energy poverty characteristics can be a very helpful analytical tool in many situations. It allows taking a pragmatic approach to renovation by segmenting the building stock and prioritising the “hot spots” that need to be addressed first. As a result, the market can learn quicker and deeper renovation best practice can develop faster.

**Collaborate with market parties to deliver renovations**

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<tr>
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<th>Relevance and effectiveness for renovation roadmaps</th>
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<tbody>
<tr>
<td><strong>Germany:</strong></td>
<td>Collaboration among this type of parties is essential for the success of the programmes in most contexts.</td>
</tr>
<tr>
<td>• The German government works collaboratively with consumer associations, consulting organisations, engineers, regional energy agencies etc.</td>
<td>As above.</td>
</tr>
<tr>
<td><strong>Sweden:</strong></td>
<td></td>
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<tr>
<td>• The Low-Energy Buildings programme (2010) aims to stimulate energy efficiency in new builds and conversion. The programme is a collaboration between the Swedish Energy Agency, the Swedish National Board of Housing, Building and Planning, the Swedish Construction Federation, Region VästraGötaland and the Swedish Research Council for the Environment, Agricultural Sciences and Spatial Planning (Formas).</td>
<td>As above.</td>
</tr>
<tr>
<td><strong>Netherlands:</strong></td>
<td></td>
</tr>
<tr>
<td>• All relevant parties (the Dutch government and associations representing energy companies, social housing providers, construction companies and the installation sector) work highly collaboratively.</td>
<td>As above.</td>
</tr>
<tr>
<td>• A one-stop contact person (who can be a contractor, energy advisor, installer or architect) takes care of the entire process, from initial advice to installation and access to subsidies/finance.</td>
<td>A one-stop contact person can be helpful. In some contexts having the same person do the energy audit as the rest of the work can be a strength, in others, where there may be trust issues, it can be a weakness. This must be evaluated on a case by case basis.</td>
</tr>
<tr>
<td><strong>Canada:</strong></td>
<td></td>
</tr>
<tr>
<td>• Licensed private energy assessment service providers hire energy advisors to provide local energy audit services. The programme is supported by provincial, territorial and municipal governments and utility companies who sometimes subsidise the audits or offer</td>
<td>As above.</td>
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additional grants. Environmental and community groups, suppliers and manufacturers, renovation contractors, trade associations etc. also promote the programme.

- Initially the EnerGuide programme offered large incentives to carry out the initial audits but most did not result in any work. Energy auditors are now allowed to sell and install efficiency measures leading to more than 70% of homes receiving initial audits actually benefiting from some retrofit work within 18 months.

UK:

- Green Deal Providers can handle all aspects of the renovation works on behalf of the homeowner, from arranging the financing to paying the installers and liaising with the electricity company to collect the money from the homeowner’s bills. They can also work with different levels of integration.
- In October 2011 a not-for-profit coalition of 16 companies has been established to help provide low cost finance, expected to be available in early 2013.

USA:

- The US Department of Energy (DOE) partnered with the National Association of Realtors (NAR) to reach homebuyers through their real estate agents and increase their knowledge on home energy use.
- DOE is also working jointly with the Building Performance Institute (BPI) to review home performance improvement standards and certifications and develop field guides.

Provide accreditation or certification of market parties

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<tr>
<td>UK:</td>
<td>Training and certification are needed to foster growing confidence in the market. Such training must be in person and sufficient to give consumers confidence in the providers. Poorly performing accredited personal can be detrimental to the confidence in a scheme and therefore to the scheme itself.</td>
</tr>
<tr>
<td>Ireland:</td>
<td>More than 4,000 registered service providers are</td>
</tr>
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associated with the delivery of the Sustainable Energy Authority of Ireland’s programmes to the residential and business sectors. The contractor must be on the Registered Contractor List (which requires proof of insurance insured and VAT registration and stating that the contractor is qualified to undertake the type of work in accordance with relevant codes). There is also a register of Building Energy Ratings Assessors with similar requirements.

<table>
<thead>
<tr>
<th>USA:</th>
<th>The program includes contractor training and certification, and third party assessment of the retrofit work upon completion.</th>
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Netherlands:  
- Standardised training course for energy auditors required for all energy auditors involved in the scheme.

Sweden:  
- The experts carrying out compulsory inspections (on buildings sold, rented, or undergoing major change use) and those who inspect HVAC systems are audited annually to assess their correct use of methodologies and tools.

Annual auditing can be useful to make sure that building experts have the required skills and apply methods correctly, thereby ensuring the quality of their advice.

### Create legal instruments to back up policy goals

<table>
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<tbody>
<tr>
<td>UK:</td>
<td>Legal requirements tend to have a stronger effect on the market (e.g. requirements that rental properties meet certain standards or requirements specified in building codes). Fiscal incentives can be powerful when part of legislation. However, loan schemes should be tailored to the situation on the market and the stage of implementation of requirements.</td>
</tr>
<tr>
<td>The Green Deal was provided for by the Energy Act 2011, and the implementing statutory instruments (SIs) were approved by both Houses in July 2012.</td>
<td></td>
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<tr>
<td>Requirements on rental properties are also set out in the Energy Act 2011.</td>
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<tr>
<td>There will be a Green Deal Ombudsman and Investigation Service, separate to the general Energy Ombudsman.</td>
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</tr>
<tr>
<td>Requirements for energy efficiency installers are set out in the Publicly Available Specification (PAS) 2030 standard.</td>
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France:  
- The Finance Law 2009 created the 0% green loan with banks offering them from June of that year.

Germany:  
- The subsidies and loans are available for energy efficient renovations that meet requirements of the quality label “Effizienzhaus” (efficient building), in line with the Energy Conservation Ordinance 2009.

USA:  
- In addition to the HPwES programme, as part of the American Recovery and Reinvestment Act of
2009, the government provided tax credits in 2010 and 2011 of up to $1,500 per single-family home for qualifying energy efficiency and renewable energy improvements.

Spain:
- Recognises that a new legislative framework will be required and acknowledges that without one it would be likely to fall well short of targets.

Basque Country:
- Recognises that legislation is a critical element for accelerating or slowing down the transformation of the Basque housing stock. This line of action will therefore encompass the introduction of action related to adapting the regulations and setting goals in the field of sustainable buildings.

Netherlands:
- In 2008 a covenant for the existing private housing stock entitled MmM was signed between the Dutch government and associations representing energy companies, social housing providers, construction companies and the installation sector. The Dutch have a history of collaboration. A voluntary mechanism may be appropriate in such circumstances. However, in many countries which do not have such a history, more legally stringent instruments would be required to back up policy goals.

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<tr>
<td>UK:</td>
<td>Innovative solutions which avoid issues of split incentives by ensuring that those who benefits from the measures also pay for the measures, will be helpful in most circumstances. Care must be taken, however, to ensure that these measures do not create additional complications (e.g. if new purchases of a house want the loans paid off before they will purchase the property).</td>
</tr>
<tr>
<td>Netherlands:</td>
<td>A voluntary tool, the “Living Costs Guarantee” was developed, whereby social renters and housing associations agree on an increase in rent that is less than amount projected to be saved on energy bills.</td>
</tr>
<tr>
<td>USA:</td>
<td>Repayments are added as fee to property tax and can pass on when the property is transferred</td>
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Provide financial support, consumer education and organisational support in combination

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<tr>
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<th>Relevance and effectiveness for renovation roadmaps</th>
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<tr>
<td>Netherlands:</td>
<td>The MmM foundation is responsible for the implementation of the plan. The Programme Board/Office coordinates efforts from the different stakeholders including bringing together the activities undertaken by real estate agents, constructors, installers, energy companies, banks etc, supporting energy savings pilot</td>
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</table>
projects and communication, and annual monitoring and reporting. Due to slow progress on financing and execution, however, the government is now considering reorganising the Programme Board while some members of the Dutch Parliament would like to see regulation or energy efficiency obligations introduced.

- A one-stop contact person (who can be a contractor, energy advisor, installer or architect) takes care of the entire process, from initial advice to installation and access to subsidies/finance.

Sensible programmes will all ensure good coordination between financial support, consumer education and organisational support in combination. These should work to ensure seamless service to consumers and make it as easy as possible for them to implement energy efficiency measures.

As mentioned above, A one-stop contact person can be helpful. In some contexts having the same person do the energy audit as the rest of the work can be a strength, in others, where there may be trust issues, it can be a weakness. This must be evaluated on a case by case basis.

<table>
<thead>
<tr>
<th>Germany:</th>
<th>Canada:</th>
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</thead>
<tbody>
<tr>
<td>The German government works collaboratively with consumer associations, consulting organisations, engineers, regional energy agencies etc. The loans are provided by the KfW Förderbank, which is 80% owned by the German government and 20% owned by the federal states.</td>
<td>The programme uses licensed private energy assessment service providers who hire energy advisors to provide local energy audit services. The programme is supported by provincial, territorial and municipal governments and utility companies who sometimes subsidise the audits or offer additional grants. Environmental and community groups, suppliers and manufacturers, renovation contractors, trade associations etc. also promote the programme.</td>
</tr>
<tr>
<td>Energy auditors are now allowed to sell and install efficiency measures leading to more than 70% of homes receiving initial audits actually benefiting from some retrofit work within 18 months.</td>
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Annex 2: Lessons learned from technology and sustainable development roadmaps

Lessons from technology roadmapping

Some industries, especially the IT industry, have more experience with technology roadmaps. These roadmaps:

• Focus on furthering a specific technology, and
• Are developed within one company or industry, and
• Are typically set within a current market and/or operational framework

Technology roadmaps identify, for a set of products: the critical system requirements, the product and process performance targets, and the technology alternatives and milestones for meeting those targets. The roadmap identifies precise objectives and helps focus resources on the critical technologies that are needed to meet those objectives. An analysis of technology roadmapping\(^\text{18}\) demonstrates that there are five essential conditions which must be met in order for a roadmapping process to be effective\(^\text{19}\):

i. There must be a perceived need by those concerned;
ii. The process needs input and participation from different relevant groups, which bring different perspectives and timelines;
iii. The roadmap needs broad participation (industry, its customers and suppliers, as well as governments and universities);
iv. The roadmapping process should be need-driven rather than solution-driven;
v. There must be a clear specification of the boundaries of the effort – what is in and what is out? How will the roadmap be used?

Lessons from sustainable development initiatives

The role of governments in sustainable development has been analysed to assess which programme designs are most effective at introducing sustainable technologies. The evaluation of the Dutch Sustainable Technology Development programme, for example, concludes that governments should encourage innovation by facilitating networking between involved parties, focusing attention on longer-term issues and increasing the chances of success of innovations. The activities undertaken within a public policy programme, therefore, should relate to this general facilitating role\(^\text{20}\):

• Helping to build new networks that bring firms, research institutes, public agents and users of technology together;
• Helping network members to reach common problem definitions, shared understandings of innovation challenges, shared visions of possible futures and shared expectations;
• Providing information, tools and approaches that network members can use to explore possible futures and to translate long-term visions into short-term action steps;
• Encouraging innovators to integrate technological, cultural and structural aspects, so that these develop in the same direction and to a consistent timeframe; and
• Helping to create conditions conducive for technologies emerging from R&D activities by liaising with policy makers about implementation needs and sustainability benefits.

\(^\text{18}\)Fundamentals of Technology Roadmapping, Sandia National Laboratories, April 1997
\(^\text{19}\) Technology roadmapping, as an established but more narrowly focused process, can provide us with the minimum requirements for a building renovation roadmap process. These essential conditions are also applicable to the process of developing a roadmap or national strategy for the deep comprehensive renovation of buildings, which is, however, far more complex, involving more parties, more aspects and a wider range of issues than an R&D effort.
\(^\text{20}\) Sustainable Technology Development, Paul Weaver et.al., 2000
These lessons are helpful in creating a framework which is conducive to addressing complex problems such as the transition to deep energy renovation of the building stock. Key elements of a sustainable development approach are similar to those for technology roadmapping, with more emphasis on building a network of all stakeholders, developing a common understanding of issues, challenges and solutions, and encouraging technological, operational and societal innovation in conjunction\textsuperscript{21}.

\textsuperscript{21} These lessons are helpful in creating a framework conducive to addressing complex problems such as the transition to deep renovation of the building stock.
Annex 3: Links to other government policy areas

Building renovation policy needs to be embedded in overall government policy, for example:

- **Housing policy:** Renovations affect the quality and availability of houses, and comprehensive or deep renovations may need to be linked to other housing goals, such as providing more homes for single person households, for elderly households and accessible homes for people with disabilities. Since the alterations needed to adapt houses require building work, as do deep renovations, combining and aligned deep renovations with other policy goals could reduce costs, speed up implementation and provide more and better homes.

- **Labour market policy:** The construction sector represents a large sector of the economy in any country, and is often the largest employer for parts of the work force. Renovation policy can increase employment opportunities for construction workers, but may also change the training and education needed to do this work. Because of its impacts on employment, renovation plans need to be aligned with labour market policy.

- **Social security policy:** The deep renovation of houses drastically reduces household energy bills, which is particularly relevant for households in fuel poverty – often elderly households living in larger houses. Renovations make housing more affordable and may reduce the need for state support for fuel-poor households.

- **Banking / financial sector policy:** Buildings are any country’s largest investment, and the mortgage market is among the key financial markets in any economy. Deep renovations add to the value of buildings and reduce operating costs, both of which improve the affordability of mortgages. Renovations also require investments, part of which will need to come from banks. Given these links, renovation programmes need to be coordinated with the financial sector, and discussions are needed about the impacts of renovations on new and existing mortgages, as well as about financing deep renovations.

- **Education policy:** Building energy efficiency in general, and deep renovations in particular, are no major parts of the education of architects, building engineers or construction workers. For the longer term, these elements need to be included in school curricula, so that the next generation of workers in this sector is better trained in energy issues and building renovation techniques.

Links to other European policy areas:

- **Cohesion fund, JESSICA, ELENA:** These all provide European support to national and regional authorities for developing financial (soft loan) mechanisms.

- **Covenant of Mayors:** The Covenant of Mayors provides tools and a mechanism for developing Sustainable Energy Action plans, which can be linked national, regional or local Renovation roadmaps.

- **European Energy Efficiency Fund:** This fund provides financing through public-private partnerships for energy efficiency and renewable energy projects and might be useful for deep renovation pilots.

- **Pact for Growth and Employment:** This policy aims to improve the competitiveness of the construction sector, and supports training and education of the construction industry, which is relevant for building more capacity for deep renovations.

- **Smart Cities and Communities:** This EU initiative aims to support the demonstration of innovations in energy, transport and ICT in urban areas, which may provide useful links to innovations in deep renovations.

- **Intelligent Energy Europe:** This programme provides support for projects or initiatives supporting new policies and could be helpful in exchanging ideas and tools across Member States.

- **Requirements to set up a national energy efficiency obligation scheme (EED, art 7).** In order to ensure this obligation will stimulate building renovation it needs to been developed carefully as part of the overall national renovation strategy requested in the EED art 4.

- **Requirement to introduce fiscal or financial support and provide information (EED, art 12 and 20):** These articles of the EED requires Member States to provide households and small commercial customers with a national strategy to promote energy efficiency, including fiscal incentives, access to finance and/or information and with the option to set up National Energy Efficiency Funds. These provisions partly overlap with the Article 4 requirements for national strategies for deep renovations and it would make sense for Member States to combine part of these requirements in building renovation roadmaps that include fiscal, financial and information provision measures.